

# Hospitalization-Associated Disability

## "She Was Probably Able to Ambulate, but I'm Not Sure"

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### THE PATIENT'S STORY

Ms N is a 70-year-old woman admitted to the medical service of an urban public hospital. She reported experiencing left labial pain and hematuria for 3 days. In the emergency department, she was in acute renal failure (serum creatinine, 10.8 mg/dL; potassium, 8.3 mEq/L).

She had a long history of type 2 diabetes mellitus, hypertension, chronic kidney disease (baseline creatinine, 3.5 mg/dL), coronary artery disease, peripheral vascular disease, and diabetic neuropathy.

Ms N emigrated from the Philippines in 1997 to join her husband, from whom she had since separated. Although her primary language was Tagalog, all communication with her during the hospitalization was in English. Her monthly income was \$300 per month from the US Social Security Administration. One of her 6 children lives locally. Prior to admission, Ms N reported that she lived independently as a guest in a friend's home and was able to care for herself until 3 days before admission.

On admission, Ms N appeared frail, shivering with a temperature of 98.2° F (36.8° C), systolic and diastolic blood pressure of 155/42 mm Hg, pulse rate of 55 beats per minute, and a respiratory rate of 22 breaths per minute. There was a 3-cm mass in the left labium majorum that was tender and indurated. She was alert and oriented to person, place, and date and walked with a normal gait. In addition to renal failure, laboratory studies were notable for hematocrit at 19.9% and her albumin level was 3.2 g/dL.

On hospital day 1, hemodialysis was started and she received empirical treatment for a urinary tract infection. On day 3, a gynecology consultant noted a fluctuant, spontaneously draining 4 × 3 cm labial lesion that was incised and

In older patients, acute medical illness that requires hospitalization is a sentinel event that often precipitates disability. This results in the subsequent inability to live independently and complete basic activities of daily living (ADLs). This hospitalization-associated disability occurs in approximately one-third of patients older than 70 years of age and may be triggered even when the illness that necessitated the hospitalization is successfully treated. In this article, we describe risk factors and risk stratification tools that identify older adults at highest risk of hospitalization-associated disability. We describe hospital processes that may promote hospitalization-associated disability and models of care that have been developed to prevent it. Since recognition of functional status problems is an essential prerequisite to preventing and managing disability, we also describe a pragmatic approach toward functional status assessment in the hospital focused on evaluation of ADLs, mobility, and cognition. Based on studies of acute geriatric units, we describe interventions hospitals and clinicians can consider to prevent hospitalization-associated disability in patients. Finally, we describe approaches clinicians can implement to improve the quality of life of older adults who develop hospitalization-associated disability and that of their caregivers.

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See also p 1800.



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drained. Later that day, Ms N was transferred to the hospital's acute care for elders (ACE) unit. There, during the daily interdisciplinary rounds, her nurse noted Ms N had difficulty transferring from bed to commode due in part to shaking and jerking of her extremities. On the Mini-Cog test, she recalled 2 of 3 objects and drew a normal clock.

The ACE team felt her myoclonus was multifactorial and recommended discontinuation of gabapentin, which was started after admission for diabetic neuropathy. Five days later, her myoclonus had resolved and she was again independent in activities of daily living (ADLs) and walking independently using a walker. She continued receiving hemodialysis 3 times weekly. She was transferred from the ACE unit to a regular medical ward while awaiting an outpatient hemodialysis slot.

Over the next 2 weeks, she developed progressive difficulty with ambulation and experienced a slow and unsteady gait even with use of a walker. She also began to need help bathing and using the toilet. The unit social worker noted her cognitive status as "foggy" and it was felt she could not safely manage her medications or finances. She was discharged on hospital day 30 to a skilled nursing facility.

Ms N, the ACE geriatrician (Dr Z), and the inpatient social worker (Ms R) were interviewed separately by a Care of the Aging Patient editor between April and October 2010, while Ms N was in her postdischarge skilled nursing facility.

## PERSPECTIVES

Ms N: *They did all the services that I needed. They took care of my medicine, my bedding, and my wardrobe. . . . The social worker was very helpful in finding me a place to go when I left the hospital.*

Dr Z (on Ms N's admission status): *She was able to walk independently. She was able to take care of all of her ADLs and IADLs [instrumental activities of daily living] before she came to the hospital. She was a pretty independent person.*

Ms R (on Ms N's status shortly after admission): *She wasn't ambulating very much; she had some neuropathy in her legs. I think that dialysis was knocking her out a lot.*

## Hospitalization-Associated Disability

Ms N illustrates an unfortunately common scenario: an older adult living independently at home and independently managing all basic ADLs develops an acute illness requiring hospitalization. During hospitalization, the acute medical issues are treated. However, the patient is discharged with a major new disability that was not present before the onset of acute illness. The patient is no longer able to complete basic self-care activities, eg, bathing independently, and has difficulty ambulating, even with a walker.

In this article, we address hospitalization-associated disability, which includes patients (like Ms N) who develop disability for the first time when hospitalized, as well as those who were disabled before hospitalization and develop further disability when hospitalized. We review the literature

on risk factors for hospitalization-associated disability, discuss interventions that may prevent it, and recommend management practices that clinicians can implement.

## METHODS

We conducted a literature review to determine which risk factors help identify older adults most likely to develop hospitalization-associated disability. We searched PubMed, CINAHL, and EMBASE from 1990 to 2011 using the Medical Subject Headings terms *aged*, *hospitalization* or *hospitals*, *activities of daily living* or *recovery of function*, and *prospective studies* or *cohort studies* or *longitudinal studies* or *odds ratio*. We did not search *middle aged*. We retained studies that either used multivariate analysis to assess the impact of a single risk factor or that considered multiple risk factors to develop a risk stratification tool. We focused on articles that compared ADL function at or shortly before hospital admission (within 1 month) to function at or shortly after hospital discharge (within 1 month).

## Incidence of Hospitalization-Associated Disability

Hospitalization-associated disability manifests as the loss of ability to complete 1 of the basic ADLs needed to live independently without assistance: bathing, dressing, rising from bed or a chair, using the toilet, eating, or walking across a room. Individuals who develop hospitalization-associated disability cannot successfully live without assistance; they become reliant on the help of caregivers or require long-term care.<sup>1,2</sup> Hospitalization-associated disability develops between the onset of the acute illness and discharge from the hospital. At least 30% of patients older than 70 years and hospitalized for a medical illness are discharged with an ADL disability they did not have before becoming acutely ill.<sup>3-5</sup> Older adults who are frail, such as those with slow gait speed, have even higher rates of hospitalization-associated disability.<sup>5</sup> The acute illness is often seemingly minor, such as an uncomplicated pneumonia or exacerbation of congestive heart failure that responds to usual medical management.<sup>5</sup> Approximately 50% of disability among older adults occurs in the setting of medical hospitalization.<sup>6</sup> Although Ms N's hospitalization was unusually long, rates of hospitalization-associated disability are high even after brief hospitalizations.<sup>3</sup> One year following discharge, fewer than half of older adults have recovered to their preillness levels of functioning and rates of nursing home placement and death are high.<sup>7,8</sup>

Although it is obvious how directly disabling illnesses such as hip fracture or stroke can lead to long-term disability, it is less obvious how Ms N's illness led to disability. Most of the acute metabolic and infectious problems that led to hospitalization showed dramatic improvement by discharge and hemodialysis should have led to an improvement in uremic symptoms. Yet her functional trajectory followed a downward spiral. This discordance between the improving trajectory of the medical diagnoses and the failure to recover functional loss occurring shortly before admission, as well as new functional loss after admission, is a common sequelae of hospitalization.<sup>9</sup>

**Acute Illness as a Precipitating Event**

Although older age disability can develop suddenly (ie, from a stroke), its onset is usually insidious,<sup>10,11</sup> meaning an individual gradually accumulates impairments that make it more difficult to independently perform an ADL. Acute illness and hospitalization then precipitate a transition to frank disability. Before hospitalization, a patient may note that getting dressed is taking greater effort but can be done without assistance. After a hospitalization, a patient might only be able to get dressed with the assistance of a caregiver.

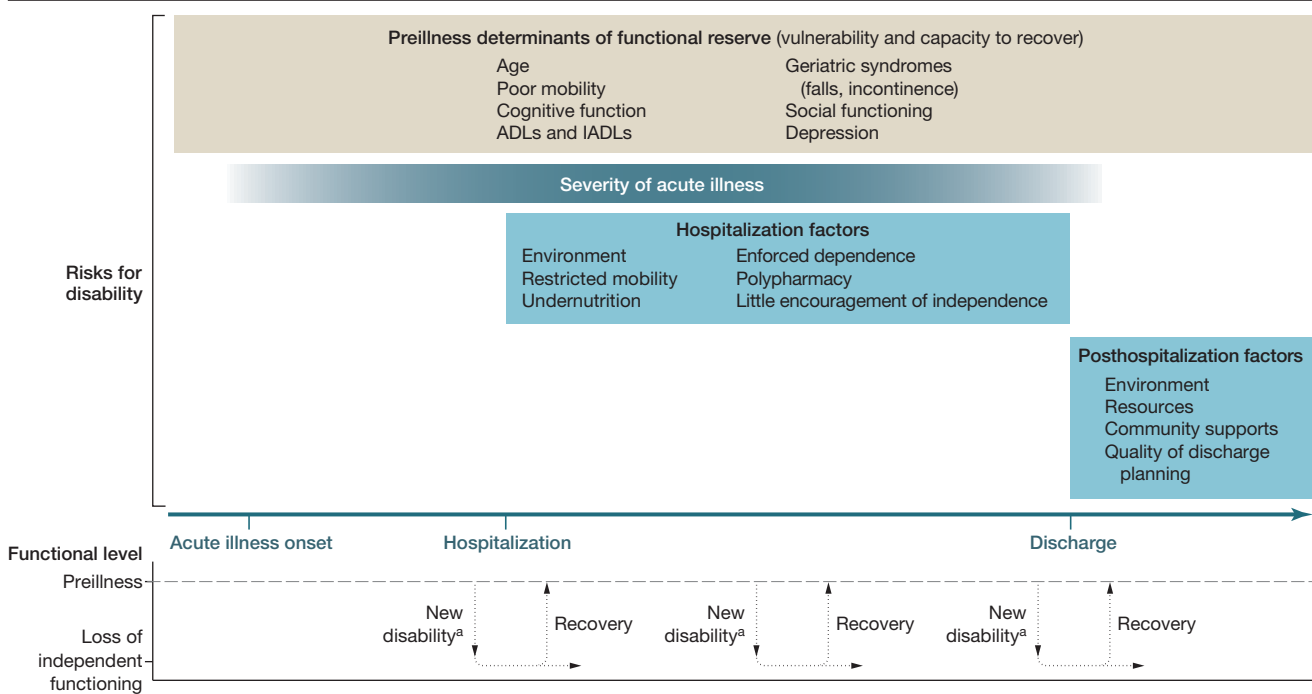
Hospitalization-associated disability can be understood through the paradigm of geriatric syndromes as it shares many features with other geriatric syndromes<sup>12</sup> such as falls,<sup>13</sup> delirium, and incontinence.<sup>14</sup> As is typical of geriatric syndromes, hospitalization-associated disability can rarely be explained by a single cause. Rather, it occurs in vulnerable older adults who accumulate impairments in multiple domains. These impairments encompass a range of vulnerabilities such as comorbid diseases, cognitive impairment, and psychosocial factors such as depression and limited social support. Precipitating events such as acute illness and hospitalization then trigger the full syndrome.<sup>3,5</sup> Processes

of hospital care including iatrogenic risks, immobility,<sup>15,16</sup> polypharmacy,<sup>17</sup> and lack of adaptive accommodations can both inhibit the recovery of functional loss that occurred immediately before hospitalization and lead to additional functional loss during the hospitalization.<sup>18</sup> The FIGURE describes how these factors interact to increase the risk of hospitalization-associated disability and loss of independence. Because hospitalization-associated disability shares many characteristics with other geriatric syndromes, it may be considered the hospitalization disability syndrome.

TABLE 1 illustrates that the risk for hospitalization-associated disability is defined by a broad range of factors, as is typical for geriatric syndromes. Age is the most potent risk factor.<sup>3</sup> More than 50% of adults older than 85 years will leave the hospital with a major new ADL disability.<sup>3</sup> Depression and cognitive dysfunction are additional potent risk factors for hospitalization-associated disability.<sup>19,23,25</sup>

Studies by Mehta et al,<sup>27</sup> Inouye et al,<sup>28</sup> and Sager et al<sup>29</sup> demonstrate that integrating information from brief multidimensional prognostic assessments identifies older adults most likely to develop hospitalization-associated disability (TABLE 2).<sup>27-29</sup> Use of such risk instruments may facilitate

**Figure.** Factors Contributing to the Development of Hospitalization-Associated Disability



Hospitalization-associated disability refers to patients who have a new disability in activities of daily living (ADLs) at hospital discharge that they did not have before the onset of the acute illness. This disability leads to the loss of independent functioning. It comprises patients who develop new disability between the onset of the acute illness and hospitalization, as well as those who develop new disability during their hospitalization. The risks for disability due to an acute illness before hospitalization and failure to recover functioning during hospitalization, as well as onset of a new disability during hospitalization, stem from the interaction of baseline functional reserve (vulnerability and capacity to recover), the precipitating event of the acute illness resulting in hospitalization, hospital processes that might contribute to disability, and factors affecting care after hospitalization discharge. Processes common to the development of geriatric syndromes include the interaction of baseline vulnerability and capacity to recover, the severity of precipitating events (acute illness), and care processes (hospital factors) that may inhibit functional recovery and promote further functional decline. IADLs indicate instrumental activities of daily living.

<sup>a</sup>Indicates that a new disability can occur at various points in the timeline between acute illness onset and hospital discharge.

early assessment of postdischarge needs and prevent the rushed planning that often occurs immediately before discharge, when it is discovered that patients are unable to adequately care for themselves.<sup>30</sup> Ms N had many risk factors for being disabled at the time of discharge, including limitations in activities such as doing housework and use of transportation, poor social functioning, and mobility difficulties. The Mehta index would have been particularly useful for Ms N as it focuses on older adults independent in all ADLs before the onset of the acute illness and likely would have suggested at least moderate risk for hospitalization-associated disability.

### Preventing Hospitalization-Associated Disability

Dr Z: *The most important thing is assessing what the level of function was before the illness. Was the patient independent with taking medicines and remembering when to take them? Does the patient remember appointments? Know what the level of independence is at baseline and if there is any change in function either cognitively or physically. Try to determine if the change is part of the acute illness.*

Ms R (referring to postadmission functioning): *She was alert . . . but having a lot of brain fog. . . . She was probably*

*able to ambulate but I'm not sure . . . I think she was just hanging out in bed.*

Although hospitalization-associated disability results, in part, from the illness necessitating hospitalization, hospital processes may play a role both in inhibiting recovery of functional loss that occurred shortly before admission and in accelerating additional functional decline during hospitalization.<sup>18</sup> For example, most hospitalized older adults spend the majority of time in bed; even short periods of bedrest accelerate muscle wasting.<sup>15,31,32</sup> Hospitalization provides opportunities for iatrogenic complications, including medication adverse effects and infections, especially in patients with indwelling devices such as urinary catheters.<sup>33</sup> Nutritional status often deteriorates during hospitalization.<sup>34</sup> This may be partially related to excessive use of nothing by mouth orders and restrictive unpalatable diets. Many of these processes also precipitate delirium, a potent risk factor for hospitalization-associated disability.<sup>35</sup>

A number of interventions have been implemented to reduce the incidence of hospitalization-associated disability. They include geriatric inpatient units (acute care of elders or ACE units), geriatric inpatient rehabilitation (also known

**Table 1.** Studies Examining Individual Risk Factors of Hospitalization-Associated Disability

Source	No. of Participants	Risk Factor	Measures of Risk Factor Assessment	Age of Participants, y <sup>a</sup>	Outcome	Effect Size AOR (95% CI)
Covinsky et al, <sup>3</sup> 2003	2293	Age	NA	80 (55%, 70-79; 35%, 80-89; 9% ≥ 90)	Loss of independence in ≥1 ADL between 2 wk before admission and discharge	Age, y 70-74 75-79 80-84 85-89 ≥90 1 [Reference] 1.21 (0.92-1.60) 1.52 (1.14-2.03) 2.23 (1.60-3.09) 2.67 (1.81-3.92)
Covinsky et al, <sup>19</sup> 1997	572	Depression	Short Geriatric Depression Scale <sup>20</sup>	79.9 (6.4)	Dependence in ≥1 ADL at hospital discharge	Depressive symptoms Low Medium High 1 [Reference] 1.86 (1.2-2.88) 2.47 (1.58-3.86)
Lindenberg et al, <sup>21</sup> 2003	1557	Mobility	Self-report <sup>b</sup>	78.3 (6.0)	Loss of independence in ≥1 ADL between admission and discharge	Steadiness Very steady Slightly steady Slightly unsteady Very unsteady 1 [Reference] 1.9 (1.1-3.2) 1.7 (1.0-2.9) 2.6 (1.5-4.5)
Mahoney et al, <sup>22</sup> 1999	1212	Mobility	Use of a walker	79.1 (6.2)	Worsening ADL function during hospitalization	Walker use No Yes 1 [Reference] 2.8 (1.6-4.7)
Sands et al, <sup>23</sup> 2003	892	Cognitive impairment	Short Portable Mental Status Questionnaire <sup>24</sup>	79.7 (6.6)	Development of a new ADL disability by discharge <sup>a</sup>	Cognitive impairment (No. of errors) None (0-2) Mild (3-4) Severe (≥5) Disabled, % <sup>c</sup> 14 28 51
Inouye et al, <sup>25</sup> 1998	458	Delirium on admission	Confusion Assessment Method <sup>26</sup>	78.9 (6.9)	New ADL disability at discharge compared with preillness baseline	Presence of delirium Absent Present 1 [Reference] 3.0 (1.6-5.8)

Abbreviations: AOR, adjusted odds ratio; ADL, activities of daily living; NA, not applicable.

<sup>a</sup>All participants were older than 70 years of age; age data for Covinsky et al<sup>3</sup> are reported as mean; data for other studies are reported as mean (SD).

<sup>b</sup>Unsteadiness was addressed as a self-reported single item, "On the day you were admitted to the hospital, did you feel very steady, slightly steady, slightly unsteady, or very unsteady?"

<sup>c</sup>Bivariate frequencies are presented because multivariate model in Sands et al<sup>23</sup> examined adjusted trajectories over time. The models in the study confirmed cognitive impairment was associated with hospital-acquired disability after adjustment.

as geriatric evaluation and management [GEM] units), geriatric inpatient consultation, Hospital at Home (HAH), and the Hospital Elder Life Program (HELP). TABLE 3 describes some of the outcomes associated with these models in clinical trials and meta-analyses.

The strongest evidence that redesigned care systems improve outcomes stems from ACE units.<sup>36,41,42</sup> ACE provides interdisciplinary care on geriatric-focused units with protocols for prevention and rehabilitation of disability.<sup>18</sup> A meta-analysis suggested that ACE units reduce the incidence of functional decline at discharge and increase the likelihood of discharge to home.<sup>36</sup> ACE units can reduce hospital length of stay and the resulting cost savings may be greater than the added costs of the unit.<sup>43</sup> One study showed increased satisfaction among patients, nurses, and physicians.<sup>44</sup> Many of the processes adopted by ACE units are also facilitated by Nurses Improving Care for Healthsystem Elders (NICHE), a program that provides resources to nurses to improve care of hospitalized older adults.<sup>44</sup> Ms N regained independence in ADL function during her brief stay

on the ACE unit, but her independence subsequently declined after she was transferred to a regular medical floor despite the continued stabilization of her acute medical problems.

Inpatient GEM units differ from ACE units in that they usually admit patients after their acute problems are stabilized.<sup>37</sup> GEM units provide a greater focus on rehabilitation than on prevention of hospitalization-associated disability. They are also more selective in their choice of patients, with a focus on those most likely to benefit from rehabilitation. ACE and GEM units share an important similarity, which is the oversight of a multidisciplinary team and the use of comprehensive geriatric assessment. A meta-analysis suggested that GEM units increase the likelihood of functional improvement by the time of discharge and lower the need for nursing home care.<sup>37</sup> Subgroup analyses suggest that GEM units are particularly promising following hip fracture.

In contrast to these models, consultative inpatient geriatric assessment has failed to demonstrate the same effect on outcomes as the interventions in which the multidisci-

**Table 2.** Studies Examining Prognosis of Hospitalization-Associated Disability

Prognostic Stratification Source	No. of Participants	Participant Age, Mean (SD), y <sup>a</sup>	Outcome	Risk Factors	Points	Total Points (Risk %, Validation Sample)	ROC Area (Validation Sample)
Mehta et al, <sup>27</sup> 2011	1638	79 (7)	Need for assistance in $\geq 1$ ADL at discharge <sup>b</sup>	Age, y		0-1 (9)	0.78
				80-89	1	2-3 (31)	
				$\geq 90$	2	4-5 (44)	
				Needed assistance in $\geq 3$ IADLs 2 wk before admission <sup>c</sup>	2	$\geq 6$ (75)	
				Mobility 2 wk before admission			
				Unable to run a short distance (but able to walk up stairs or uphill)	1		
				Unable to walk uphill or up stairs	2		
				No. of ADLs for which assistance was needed at admission:			
				2-3	1		
				4-5	3		
				Metastatic cancer or stroke	2		
				Severe cognitive impairment <sup>d</sup>	1		
				Albumin $< 3.0$ g/dL	2		
Inouye et al, <sup>28</sup> 1993	330	78.1 (6.0)	New need for assistance in $\geq 1$ ADL between admission and discharge	Pressure ulcer	1	0 (6)	0.77 <sup>f</sup>
				Poor cognitive function on admission <sup>e</sup>	1	1-2 (29)	
				Needed assistance with $\geq 1$ ADL 2 wk before admission	1	3-4 (83)	
				Low social activity before admission	1		
Sager et al, <sup>29</sup> 1996	827	80 (6.1)	New need for assistance in $\geq 1$ ADL between 2 wk before admission and discharge	Age, y		0-1 (19)	0.65
				75-84	1	2-3 (31)	
				$\geq 85$	2	4-5 (55)	
				Poor cognitive function <sup>g</sup>	1		
				Needed assistance in $\geq 3$ IADLs 2 wk before admission <sup>c</sup>	2		

Abbreviations: ADL, activities of daily living; IADL, instrumental activities of daily living; ROC, receiver operating characteristic.

<sup>a</sup>All participants were older than 70 years of age.

<sup>b</sup>Patients in this study needed no assistance in any ADL 2 weeks prior to admission.

<sup>c</sup>IADLs included using the telephone, accessing transportation, shopping, preparing meals, doing housework, taking medicines, and handling money.

<sup>d</sup>Severe cognitive impairment was defined as a diagnosis of dementia or 5 or more errors or inability to perform on the Short Portable Mental Status Questionnaire.<sup>24</sup>

<sup>e</sup>Poor cognitive function was defined as a score of less than 20 on the Mini-Mental State Examination.

<sup>f</sup>Calculated from data in Inouye et al.<sup>28</sup>

<sup>g</sup>Poor cognitive function: score  $< 15$  on abbreviated 21-item Mini-Mental State Examination that excluded naming, repetition, 3-stage command, reading, writing, and copying.



plinary team takes a primary role in patient care.<sup>39</sup> The lessons from ACE and GEM units suggest that the usual scenario, in which physical therapy, occupational therapy, and geriatrics are provided as isolated consultation services, is less effective than integrating all of the disciplines into the multidisciplinary team.

Some of the best evidence that hospital processes contribute to poor outcomes derives from randomized studies that reengineer these processes. A study of the HELP, which targets delirium prevention by instituting protocols to promote sleep, provides aids for sensory impairment and re-orientation, promotes hydration, and promotes daytime activity, showed that delirium incidence could be reduced by one-third.<sup>38</sup>

Some studies have proposed moving as much hospital care as possible to the home setting.<sup>40,45</sup> Although evidence is lim-

ited, a nonrandomized comparison suggested that this approach is safe and may lead to modest reductions in disability.<sup>40</sup>

### The Physician's Role in Preventing Hospitalization-Associated Disability

**Assessing and Documenting Disability, Mobility, and Cognition.** By the end of her hospitalization, Ms N lost her ability to function independently and required care in a nursing home. Her nursing home care, paid for by Medicaid, resulted in substantial public expense.<sup>46</sup>

Although Ms N's functional status was an essential measure of her clinical well-being, the medical record suggests that it was sporadically assessed during her hospitalization. Failure to assess functional status in hospitalized patients is the norm, with 1 study showing that more than 50%

**Table 3.** Innovations to Improve Outcomes for Hospitalized Older Adults

Study	Study Design	Intervention	Main Intervention Component	Participant Characteristics	Outcome Measures	Results
Baztan et al, 2009 <sup>36</sup>	Meta-analysis of 5 randomized controlled trials	Acute geriatric units (acute care of elders [ACE] units)	Participants received interdisciplinary care during the acute phase of their illness on geriatric inpatient units designed to prevent and rehabilitate disability	≥Aged 65 y (range of mean [SD] values, 78 [5]-81 [6] y); patients required acute inpatient medical care	Mortality at discharge Discharge to home (vs nursing home) Functional decline at discharge	No effect on mortality (RR, 0.83; 95% CI, 0.60-1.14) Discharge to home (RR, 1.30; 95% CI, 1.11-1.52) Functional decline at discharge (RR, 0.82; 95% CI, 0.68-0.99)
Bachmann et al, 2010 <sup>37</sup>	Meta-analysis of 17 randomized controlled trials; many of the participants were post hip fracture or surgery	Inpatient geriatric rehabilitation	After participants' acute conditions stabilized, patients received interdisciplinary inpatient care on geriatric units; includes trials of Geriatric Evaluation and Management (GEM) units	≥Aged 65 y (mean age range, 74-85 y) patients' acute conditions have been stabilized	Discharge to nursing home Function at discharge	Discharge to nursing home (RR, 0.64; 95% CI, 0.51-0.81) OR for function (OR, 1.75 [ $>1.00$ favors intervention]; 95% CI, 1.31-2.35)
Inouye et al, 1999 <sup>38</sup>	Controlled trial using prospective matching strategy	HELP	Participants were treated in units implementing delirium prevention protocols targeting vision, hearing, hydration, orientation, sleep, and activity	≥Aged 70 y (mean [SD], 80 [6] y); 852 patients who were admitted to a general medicine service	Delirium incidence Delirium days No. of delirium episodes	OR, 0.60 (95% CI, 0.39-0.92) 105 d (intervention) vs 161 d (control), $P = .02$ 62 Episodes (intervention) vs 90 episodes (control), $P = .03$
Reuben et al, 1995 <sup>39</sup>	Randomized clinical trial	Comprehensive inpatient geriatric assessment	Consultation by social worker, nurse practitioner, and geriatrician with follow-up recommendations made to primary team	>Aged 65 y (mean age, 77 y); 2353 hospitalized patients had at least 1 of 13 conditions	Mortality and functional ability	Mortality rates and functional ability were similar at baseline, 3 mo, and 12 mo
Leff et al, 2009 <sup>40</sup>	Prospective nonrandomized clinical trial	HAH	Acute hospital level care at home rather than hospital for selected patients by providing nursing and physician care, diagnostics and therapeutics, and appropriate skilled therapies	>Aged 65 y (mean age [SD], 77 [7] y); 214 community-dwelling participants who required hospitalization for CHF, CAP, COPD, or cellulitis; 84 were treated in HAH, 130 in an acute care hospital	Change in ADL and IADL score from 1 mo prior to admission to 2 wk postadmission	Patients in HAH showed less decline and more improvement in IADL function than those treated in hospital ( $P = .04$ )

Abbreviations: ACE, acute care of elders; ADL, activities of daily living; CAP, community-acquired pneumonia; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; GEM, geriatric evaluation and management; HELP, Hospital Elder Life Program; HAH, Hospital at Home program; IADL, instrumental activities of daily living; OR, odds ratio; RR, relative risk.

of major functional limitations are not documented.<sup>47</sup> The admission evaluation included little evaluation of functional status, and the functional course that led to Ms N's inability to return home is unclear. However, several of her caregivers noted an inability to bathe independently at discharge, along with very limited mobility.

Functional status can change frequently between the onset of the acute illness, hospitalization, and discharge. These changes in functional status are powerful prognostic tools, predicting mortality and other health outcomes during and after hospitalization. Clinicians should view functional status over the course of hospitalization as a vital sign that can help guide care and serve as a guidepost of clinical well-being. We suggest that the key domains that should be documented include baseline ADL function, mobility, and cognition. Although other domains such as IADLs and screening for depression may be considered, our recommended assessment is guided by a belief that by keeping the screen simple and focused, clinicians will be better able to implement the screen in practice.

Considerable information about a patient's level of functioning can be obtained without a large expenditure of time. Core measures should be assessed on admission and in daily rounds (TABLE 4). The assessment we recommend is not comprehensive, but is guided by pragmatism and the needs of the busy clinician. This screening has not been tested prospectively for effectiveness but the components yield a functional portrait that is prognostically useful<sup>48</sup> and provide a much richer portrait of the clinical condition of the older patient.

First, at admission, learn from the patient (or caregiver) about the ability to perform ADLs. Typically, before the ability to independently perform an ADL is lost, the older adult may report difficulty completing the activity.<sup>49</sup> Therefore, it is useful to inquire as to whether the patient has difficulty, and if so, to learn whether the activity can still be completed without assistance. To determine how the current illness has affected ADL functioning, we suggest asking about the patient's ADL functioning on the day of admission and before the onset of the acute illness.

The frequent ADL changes that occur over the course of hospitalization may be best observed by nonphysician members of the health care team such as nurses and physical and occupational therapists. These individuals often observe functional status over the full day, while physicians may be primarily observing patients during morning rounds. Regular review of notes and good interdisciplinary collaboration could help physicians better monitor this functional status vital indicator. As hospitals develop electronic medical record systems, efforts to better collate and use functional information has the potential to improve care.<sup>50</sup>

Second, we suggest a brief mobility assessment to assess whether the patient can sit up in bed without assistance, stand, and walk a few steps. This should be done on admission and on daily rounds, as impairments in mobility are strongly associated with an increased risk of hospitalization-associated disability.<sup>21</sup> Our suggested assessment of mobility, a functional neurologic assessment, takes less time than the assessment of strength, sensory function, and reflexes and usually will be more useful.

**Table 4.** Minimum Functional Assessment in Hospitalized Older Adults

Functional Domain	Assessment on Admission	Daily Assessment
ADLs: taking a bath or shower; getting dressed; transferring (getting out of bed and out of a chair); using the toilet; eating; and walking across a room	For each ADL, the following elements should be assessed at admission and before onset of illness: Difficulty with ADL: "On the day of admission did you have any difficulty bathing or taking a shower? Did you have any difficulty bathing before the onset of the problem that led to your being hospitalized?" Ascertainment of equipment use for walking (cane or walker) or bathing (shower chair and rails) If patient reports difficulty, assess need for help: "On the day of admission, did you need the help of another person to bathe? How about before this illness?" If the patient needs help, assess adequacy of help: "What help do you need? Who helps you? Do you get enough help?"	Ask nurse or nursing assistant at bedside the extent of help they are providing for bathing, dressing, transferring, using the toilet, eating, and walking Review nursing and physical/occupational therapy notes
Mobility	Observe by asking the patient the following: To sit up in bed without assistance To get out of bed and stand To walk a few steps, using a cane or walker as necessary	Repeat on daily rounds
Cognitive function	Administer the MiniCog Give the patient 3 items to remember (ie, bird, paper, watch) Ask the patient to draw a clock, setting hands to show 11:10 (patient should draw circle, place numbers, place hands) Ask patient to recall the 3 words Score 2 points for correct clock and 1 point for each correct word ≥3 Points indicates a passing score	Assess for delirium on daily interview with patient and consider: Orientation: "What day of the week is it?" Inattentiveness (does the patient have difficulty focusing, is patient easily distractible) Unclear thinking (does the patient seem to ramble; is the flow of speech unclear, tangential, or difficult to follow) Assess these parameters for fluctuation over time Review nursing notes looking for evidence of these features

Abbreviation: ADL, activities of daily living.

We recommend that all older patients receive a brief assessment of cognitive function on admission. The Mini-Cog, which consists of the clock draw test in addition to the 3-item delayed recall, is a brief and useful screening test—as negative screens markedly reduce the likelihood of cognitive impairment.<sup>51</sup> The screen is considered negative if the patient can remember all 3 items or if the patient can remember 1 to 3 items and has a normal clock draw result. This classification has a sensitivity of 99% and a specificity of 93% for a diagnosis of dementia.<sup>51</sup> Identifying dementia can help clinicians identify patients at high risk for developing delirium, an acute change in mental status marked by features such as disorientation and inattentiveness.<sup>52</sup> Since an abnormal Mini-Cog could also be due to delirium, it should be followed up with a tool such as the Confusion Assessment Method (CAM) to determine if the patient has delirium. The CAM has a sensitivity of 96% and specificity of 93% in diagnosing delirium.<sup>26</sup>

Like 30% of hospitalized older adults, Ms N almost certainly had undiagnosed delirium, which was described as “brain fog.”<sup>52</sup> It takes little clinical skill to recognize the hyperactive form of delirium in the agitated patient. However, the hypoactive form is equally dangerous, at least as common, but much less likely to be recognized.<sup>53</sup> It is important to be alert to the possibility of delirium in the very quiet patient. During rounds, the patient may seem confused, inattentive, lethargic, or give tangential answers to questions. Review of nursing notes may reveal that mental status and alertness may increase and decrease over the course of a day.

### **Incorporating Prevention of Hospitalization-Associated Disability Into Practice**

Ms R: *Like what happens with a lot of older people, she probably did very well in the ACE unit because they're specially trained to get her out of bed multiple times a day and have her up for meals, but then went to a unit where she was feeling crummy and was not encouraged to get up multiple times a day. . . . [it] was a really good unit, but they just don't have the training.*

To describe steps hospitals and clinicians can consider to prevent hospitalization-associated disability, we categorized the common characteristics of ACE units by reviewing the 5 randomized controlled studies<sup>41,42,54-56</sup> included in a meta-analysis<sup>36</sup> (TABLE 5).

Most inpatient geriatric units create significant environmental modifications. For example, carpeted floors are used to increase ambulation. The hospital's often loud, disorienting environment is mitigated by interventions to reduce noise and provide aids to improve orientation. Processes that restrict mobility such as excessive bed rest orders are avoided. In addition, the common practice of restricting patient mobility to avoid falls is replaced with a focus on enabling safe mobility.<sup>57</sup> A focus is often placed on the avoidance of functional restraints such as poles for administering intravenous medications and indwelling urinary

catheters (the 1-point restraint).<sup>33</sup> For example, urinary catheters are seldom indicated for monitoring volume status as it is unlikely that the value of the information gained justifies the increased risks of infection and immobility.

Preventive and rehabilitative protocols are in place for each of the basic ADLs and capable patients are encouraged to continue performing each ADL independently without assistance. Patients who are able continue to bathe or dress independently and are encouraged to dress in their street clothing instead of hospital gowns. Physical and occupational therapy interventions are in place for each ADL for which patients need help.

Most inpatient geriatric units conduct daily reviews of medical care, focusing on both pharmacologic and non-pharmacologic care. Daily review of medications often focuses on reducing unnecessary psychoactive and anticholinergic medications. Dietary and no food by mouth orders are also reviewed, avoiding overly restrictive diet orders.

A hallmark of ACE units is an intensified emphasis on planning, beginning on the day of admission, for the patient's needs after leaving the hospital. Several units have replaced the concept of discharge planning (ie, getting the patient out of the hospital) with planning to go home, replacing the utilization management focus with a patient-centered focus.<sup>41,42</sup> Planning to go home focuses on the patient's expected functional trajectory and resulting needs, as well as the needs of the caregiver(s).

What can clinicians who cannot admit patients to an acute geriatrics unit do to prevent hospitalization-associated disability? Although no studies examine the effect of any individual clinician action on the risk of hospitalization-associated disability, many of the elements of ACE unit care can be implemented by individual clinicians (Table 5). In addition, Malone et al<sup>58</sup> has demonstrated that many elements of ACE care can be implemented at hospitals without ACE units or geriatricians on staff. We recommend several high-priority actions that clinicians may consider to prevent hospitalization-associated disability. Although these actions have not been studied in randomized controlled trials (RCTs) as isolated interventions, many of them have been included in RCTs of multicomponent interventions.

First, better recognition of functional status and more direct efforts to communicate with other disciplines such as nursing, social work, and physical therapy can mimic some elements of interdisciplinary care. Second, clinicians should walk patients, encourage exercise if the patient is able, and encourage patients to ambulate from bed to the chair as much as possible. This should include removing any unnecessary tethers such as oxygen, bladder catheters, and intravenous catheters, creating hospital norms that patients are expected to walk regularly if they are able, and requesting physical therapy consultation when assistance may be helpful. Third, make sure that patients are eating adequately. This should include attention to actual intake, assurance that food is available when the patients are on the ward, availability



**Table 5.** Processes of Hospitalization That May Lead to Hospitalization-Associated Disability and Quality Improvement Interventions From Acute Geriatric Units

Hospital Factors Leading to Hospitalization-Associated Disability	System Interventions to Help Reduce Hospitalization-Associated Disability	Physician Interventions to Help Reduce Hospitalization-Associated Disability
Environmental factors		
Environment that discourages mobility and exacerbates disorientation	Geographically defined unit that encourages mobility and limits disorientation	NA
Shiny floors that increase likelihood of falls, limit ambulation	Carpeted floors	NA
Meals served in hospital room, leading to social isolation and immobility	Common eating area	NA
Noisy environment disrupting sleep; day/night sleep reversal	Quiet environment (eg, soft phones, silent pagers, closed doors, acoustical ceilings, headphones, earplugs)	NA
Few orientation cues leading to disorientation and confusion	Frequent reorientation; large calendars and clocks	NA
Sensory and social deprivation	Easy access to low vision and assistive hearing devices; availability of glasses and hearing aides used at home Encouraging family members to stay with patient overnight	NA
Restricted mobility		
Bedrest orders and limited access to bedside chairs	Nurses encourage mobility Easy access to bedside chair; standing orders for all able patients to be out of bed and in a chair Availability of physical therapy services and assistive devices	Avoid bed rest orders; include orders for patient to be out of bed and in a chair for all meals and to ambulate 3 to 4 times daily in the hallway
High beds with rails that lead to immobilization	Low beds with rails down	NA
Use of restraints	Restraint reduction program	Limit orders approving restraints; review need for restraints throughout day
Use of functional restraints including intravenous poles, nasal cannula oxygen, and indwelling urinary catheter	Limit placement of bladder catheters in the emergency department	Daily review of need for intravenous connections, oxygen, and bladder catheters limit indications for bladder catheters to urinary retention and institute voiding trials early
Undernutrition and dehydration		
Frequent and prolonged use of no food by mouth orders	NA	Daily review of need for no food by mouth orders
Diet not consistent with patient preferences	Provide diets consistent with majority of patients and populations served	Minimize restricted diets
Lack of access to water and other fluids	Easy access to snacks; provide and encourage oral hydration throughout day	NA
Enforced dependence		
Patient performs few ADLs in hospital, nursing staff assists with ADLs regardless of patient's ability	Protocols for each ADL to encourage patient independence: Bathing: nurse supervises, patient encouraged to do as much of activity as possible Dressing: patient is encouraged to wear street clothing Using the toilet: elevated toilet fixture Transferring: assistive devices provided (eg, grab bars) and accessible from bedside	Set expectation with patient and family that the patient should independently perform own ADLs as much as possible
Polypharmacy		
Limited review of drugs; seldom assessed for efficacy or stopped once started	Engage clinical pharmacists to round with primary teams to reduce polypharmacy and increase prescribing appropriateness	Daily review of medications
Use of psychoactive drugs for behavioral disturbance and sleep	Behavioral and nonpharmacologic sleep protocols to minimize use of psychoactive medications	Minimize drugs associated with delirium, particularly anticholinergics and sleep drugs such as diphenhydramine or lorazepam
Discharge planning		
Focus on discharge planning	Focus on planning for home	Meet early with patient, family, and social worker to begin planning needs for discharge to home
Often occurs late	Initiated on admission by multidisciplinary team	NA
Motivated by bed utilization team rather than patient-centered	Explicit focus on patient and family needs at home; organizing hospital care and discharge services to facilitate return to home	NA

Abbreviations: ADL, activities of daily living; NA, not applicable.

of food from home, and minimization of no food by mouth and restrictive diet orders. Fourth, sedative hypnotics and antihistamines should be avoided, including at bedtime. Safer nonpharmacologic protocols to aid patients with difficulty sleeping should be considered.<sup>38</sup>

### The Effect of Disability After the Hospitalization

Disability associated with hospitalization is a sentinel event that often has profound effects on the patient and family long after hospital discharge. Whether patients will be able to live at home will depend not only on their capacity but also on their social support, resources, and environment.<sup>59</sup>

Planning for a patient's return to home should include assessing whether the patient can successfully accomplish ADLs alone or with available support and recognizing that many patients able to perform these activities before acute illness may be unable to perform them upon returning home. For a patient like Ms N, who needed help bathing, had very limited mobility, and whose cognitive limitations necessitated help taking her medications, it is important to specifically assess how these tasks will be completed and whether temporary home assistance or equipment could help the patient to return home. For example, could providing support bars and a shower chair restore independence in bathing? Does the patient need only supervision while bathing or is an aide needed to help the patient in and out of the shower? A matter as simple as the number of stairs the patient must scale may make going home unsafe. Although Ms N was able to walk short distances with a walker, this level of disability was made more serious by her need to reliably use transportation to attend dialysis. Patients dealing with new disabilities may benefit from a home equipment evaluation, completed by a physical or occupational therapist visiting the home, a service covered by the Medicare Skilled Home Care benefit.<sup>60</sup>

Ms N's delirium was another important consideration in the assessment of her ability to function at home. It is increasingly recognized that delirium can be stubbornly persistent and often does not resolve by discharge.<sup>61</sup> Although efforts to reconcile medications and instruct patients in their use at discharge are laudable, they may be futile in delirious patients. The patient's ability to understand medication instructions should be assessed and caregivers may need to be included in discharge education. Assistance with medicines is a skilled nursing need that will justify Medicare payment of postdischarge home nursing support.<sup>60</sup> Beyond medication concerns, cognitive concerns will also effect the ability to manage finances.<sup>62</sup>

Finally, for Ms N, poverty and her lack of social support was another precipitant of loss of independence.<sup>63</sup> Others with Ms N's level of disability, but greater financial resources, likely would have been able to pay for home health aide assistance that would have made staying at home possible.

The care of Ms N illustrates the importance of considering the ability of the patient's caregivers.<sup>64</sup> Family caregiving of-

**Table 6.** Walter Prognostic Index<sup>a</sup>

Risk Factor	Points
Male sex	1
ADL dependencies at discharge <sup>b</sup>	
Dependent in 1-4 ADLs	2
Dependent in all 5 ADLs	5
Comorbid conditions	
Congestive heart failure	2
Cancer, solitary	3
Cancer, metastatic	8
Laboratory values on admission	
Creatinine $\geq 3$ mg/dL	2
Albumin 3.0-3.4 g/dL	1
Albumin $< 3.0$ g/dL	2
<b>Point Score</b>	<b>1-Year Mortality, %</b>
0-1	4
2-3	19
4-6	34
$> 6$	64

Abbreviation: ADL, activities of daily living.

<sup>a</sup>The 5 ADLs considered were bathing, dressing, transferring, using the toilet, and eating.

<sup>b</sup>Data adapted from Walter et al.<sup>48</sup>

ten comes at significant physical, financial, and emotional costs.<sup>65</sup> Caregivers often give up employment to provide care and report very high rates of depression.<sup>66</sup> This patient's friend and daughter had apparently reached their respective limits. Considering Ms N's capacity in the context of her support system and resources made returning home unsafe.

### Prognosis of the Hospitalization-Associated Disability

Hospitalization-associated disability has a poor prognosis. Over the ensuing year, many will make transitions in and out of disability.<sup>67</sup> In a study of older adults who had developed hospitalization-associated disability, 41% died by 1 year, 29% remained disabled at 1 year, and only 30% returned to their preillness level of function.<sup>7</sup> These outcomes, for what may often appear to be nondisabling acute illness episodes, are similar to those reported for older adults hospitalized for hip fracture.<sup>68</sup>

Prognostic stratification can be challenging, but assessment of prognosis at discharge may be useful in guiding care and counseling patients and families. The Walter Prognostic Index can be used to estimate prognosis in hospitalized patients at discharge (TABLE 6).<sup>48</sup> Ms N's Walter score was 5 (2 points for dependence in 1 ADL, 2 for a high creatinine level, and 1 for low albumin), suggesting a 34% 1-year mortality risk. Her prognosis for return to independent functioning was poor, with the generally low likelihood of functional recovery made worse by the need for dialysis and nursing home placement.<sup>7,69</sup> One study suggests that nursing home residents who initiate dialysis have accelerated functional loss after dialysis initiation and seldom improve in ADL functioning within 1 year of dialysis.<sup>69</sup>

At the time of hospital discharge, in a newly disabled older patient, it is useful to consider to what extent the disability

is a reversible manifestation of the acute illness and the deconditioning effects of hospitalization, vs a manifestation of ongoing progressive disease that may be leading toward the end of life. In most cases, it will be difficult to fully answer this question until the posthospitalization course is revealed. There is little research to determine which patients with hospitalization-associated disability will benefit from rehabilitation. In patients in whom restoration of function is important, a trial of outpatient or inpatient physical therapy and rehabilitation seems reasonable.

The often poor prognosis for hospitalization-associated disability suggests that simultaneous pursuit of both rehabilitative care and palliative approaches be part of the care of patients who develop disability. For example, for Ms N, would equipment such as a motorized scooter have made life easier? Would home modifications have been helpful? What could have been done to assist her caregivers? Would community resources such as meals on wheels or paratransit services have been useful? Which of her symptoms needed treatment? Disabled older adults often have unrecognized and untreated pain, which goes unnoticed as the hospital discharge plan is formulated because it may be unrelated to the acute illness. For example, in the last 2 years of life, arthritis is a stronger determinant of pain than the diagnosis leading to death.<sup>70</sup>

Unfortunately, the palliative needs of patients are often not considered unless a patient is referred for hospice care, which in practice usually occurs in the final days of life.<sup>71</sup> However, palliative care is appropriate for all patients with serious, incurable chronic illnesses.<sup>72</sup> For example, Ms N would not meet traditional hospice criteria, and might benefit from both life-prolonging therapies such as dialysis as well as aggressive symptom management. It is a common mistake to believe that patients must choose between traditional medical care and palliative care.

## CONCLUSIONS

Hospitalization-associated disability is an unfortunately common occurrence in hospitalized older adults with significant consequences for patients and caregivers. Clinicians should supplement the traditional disease-focused approach to hospital care with one that recognizes that changes in functional status are a clinical vital sign and the most important manifestation of illness in older adults across admitting diagnoses. Reengineered hospital care that focuses on function, including assessment on admission and throughout the hospital stay, promoting physical activity, avoiding hospital processes and complications that impair functional recovery, and planning for discharge home with the support needed to complement a patient's functional capacity, may reduce the incidence of hospitalization-associated disability. Adoption of models of care that can reduce hospitalization-associated disability should be a high priority for hospitals and clinicians caring for older patients.

## Follow-up

Ms N was unable to return home and 6 months following her hospitalization was still living in a nursing home. However, she was adjusting well to her dialysis and her new home situation. At her most recent outpatient primary care clinic visit, Ms N reported only some dizziness following hemodialysis. Her arteriovenous fistula had matured and was ready for use. She reported good appetite and stable weight.

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# Online-Only Resources

## MODELS OF HOSPITAL CARE FOR OLDER ADULTS

### Nurses Improving Care for Healthsystem Elders (NICHE)

A national geriatric initiative funded by the John A. Hartford Foundation to improve the care of older hospitalized adults. The NICHE program comprises nearly 300 hospitals throughout North America. NICHE is a program of the Hartford Institute for Geriatric Nursing at New York University College of Nursing.

<http://www.nicheprogram.org/>

<http://www.jhartfound.org/pdf%20files/NICHE.pdf>

### Description of Acute Care for Elders (ACE) Units

Includes evidence for effectiveness and required elements for successful implementation of ACE units.

<http://www.jhartfound.org/pdf%20files/ACEunits.pdf>

## BUSINESS CASE FOR GERIATRICS PROGRAMS IN HOSPITALS

These publications make the case that programs focusing on older adults in the hospital can pay for themselves and improve outcomes.

<http://www.jhartfound.org/pdf%20files/Business%20Case.pdf>

<http://www.ncbi.nlm.nih.gov/pubmed/19124861>

## DELIRIUM

### The Hospital Elder Life Program (HELP)

Designed to reduce delirium in hospitalized older adults. This Web-

site provides information about delirium and a description of HELP for institutions interested in adopting the program.

<http://www.hospitalelderlifeprogram.org/public/public-main.php>

Review article summarizing 2 decades of research on delirium including prevalence, incidence, risk factors, precipitating factors, and prevention.

<http://www.nejm.org/doi/full/10.1056/NEJMra052321>

## FALLS

Systematic review of interventions that can prevent falls in hospitals.

<http://www.ncbi.nlm.nih.gov/pubmed/20091578>

## CARE TRANSITIONS

This Website provides information and tools on improving the quality and safety of transitions of care across care settings.

<http://www.caretransitions.org/>

### Next Step in Care

This Website, sponsored by the United Hospital Fund of New York, provides helpful guides for family members and health care providers for patients who are transitioning between health care settings.

<http://www.nextstepincare.org/>

### Society for Hospital Medicine

Website contains information about the BOOST (Better Outcomes for Older adults through Safe Transitions) care transitions program. Resources include materials to help

hospitals optimize the discharge process.

[http://www.hospitalmedicine.org/ResourceRoomRedesign/RR\\_CareTransitions/CT\\_Home.cfm](http://www.hospitalmedicine.org/ResourceRoomRedesign/RR_CareTransitions/CT_Home.cfm)

## BLOGS FOCUSED ON OLDER PATIENTS WITH SERIOUS ILLNESS

### GeriPal

This blog is a forum for discussion of research, news, policy, and commentary focused on care of older patients, patients with serious illness, and patients nearing the end of life.

<http://www.geripal.org/>

### HealthAGenda

This blog, sponsored by the John A. Hartford Foundation, focuses on introducing aging and geriatrics into the broader conversation around health, health care, and policy.

<http://www.jhartfound.org/blog/>

### Pallimed

This blog describes new research and policy developments in palliative and hospice medicine.

<http://www.pallimed.org/>

### The New Old Age

This blog at the New York Times chronicles the challenges older individuals and their caregivers face as elders become dependent on caregivers for basic needs. Lead blogger Paula Span and others provide pragmatic advice and commentary.

<http://newoldage.blogs.nytimes.com/>